Why we have such trouble implementing software improvements: Is there a misfit with strategy?

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ABSTRACT
We often hear that it is difficult to get software (process) improvement into practice. At least one important reason for this is that traditional software improvement is not aligned with business objectives. When software improvement is aligned with an organization's market discipline then the implementation is accelerated.

Keywords
Implementation, deployment, technology transfer, fit, strategy, *Discipline of Market Leaders*

1 INTRODUCTION

One of the reasons it is difficult to get improvement actually accomplished, practiced, in the ways we develop and manage software is that it is unaligned with organizational objectives. Such improvement is traditionally used to increase quality, increase programmer productivity, and reduce costs. Oddly enough, these are not the highest priority objectives for a number of organizations, so therefore software process improvement is difficult to implement in them.

The Discipline of Market Leaders [2] is a survey of how 80 organizations out-achieved their competitors. The authors found that focusing on one of three market areas was the answer: operational excellence, customer intimacy, and product innovativeness. Operationally excellent organizations have a "formula" for their service or product. Their menu of choices is small, limited, and with that menu they deliver excellently. Standard examples are McDonalds and Federal Express.

Customer intimate organizations seek quite a different market niche, namely a total solution. Whatever the customer wants gets added to the menu. The menu is long and custom-made for each engagement. Financial service institutions might call customer intimacy a way of getting a greater share of the customer's wallet, there are few spending alternatives outside of the services offered: bank and savings accounts, certificates of deposit, credit and debit cards, brokerage services, frequent flyer mileage incentives, travel arrangements, etc.

Product innovative organizations pride themselves on maximizing the number of turns they get in the market. They introduce many new products, selling innovation and features as opposed to, say, price. Examples are Intel, 3M, Sony, and Bell Labs. They measure their success by the number of new product introductions, the number of patents, and/or the number of Nobel prize laureates.

The authors of *The Discipline of Market Leaders* are quick to point out that all organizations have to have at least threshold characteristics of all three disciplines, but the most successful organizations have to focus on and excel at only one. One example of lop-sidedness cited was IBM's legendary customer intimacy being out-weighed by its inattention to price (that is, operational excellence), so competitors that were not as strong in customer intimacy could gain in-roads to IBM customers with lower prices.

2 IMPROVEMENT REFERS TO ONLY ONE DISCIPLINE: OPERATIONAL EXCELLENCE

Improvement of the type we are used to, the type espoused by the Software Engineering Institute, the European Software Institute, and ISO, for examples, applies almost exclusively to organizations wishing to be operationally excellent. We typically have nothing to offer to customer intimate and product innovative firms in our improvement methods.

Many software development organizations do not strive to become operationally excellent, so we have left them in the lurch, and we tend to treat them as resisters and of bad character! In fact, it may be nothing more than a mismatch of goals. There is, for example, a large set of software development organizations that strive for customer intimacy and essentially will do anything their clients request. Those organizations get to know their clients very, very well, sometimes better than the clients knows themselves. An example of this might be a payroll service that has seen

every variation on payroll and knows more about payroll processing than any in-house payroll department could. The most customer intimate payroll service offeror would take over their customers' entire payroll departments!

What do you think Microsoft's market discipline is? I think it is product innovativeness. It touts its new, glitzy features, not its up-time or reliability. It wants to own/earn its clients based on new features, not offering software that is operationally excellent. In that context, the Software Engineering Institute's Capability Maturity Model for Software[SM] is silent on product innovativeness and customer intimacy: it applies only to organizations wanting to be operationally excellent.

What are we missing in all of this? A more global view, one that listens to and responds to our improvement customers. We need to see that the potential rejection of our improvement efforts is NOT an indicator of bad character or resistance, but may be an appropriate response to improvements that do not fit the strategy. We need to jointly problem-solve with our clients to develop new classes of improvements that simultaneously meet our high standards for effectiveness and their high standards for relevance.

3 MISMATCH OF GOALS IN THE CMM

For example, even at the higher maturity levels there may be a mismatch. Take "Technology Change Management," a level 5 key process area and one of the few that directly addresses implementation of improvement. According to the Capability Maturity Model for Software[SM], version 1.1, it has three goals:

Goal 1	**Incorporation of technology changes are planned.**
Goal 2	**New technologies are evaluated to determine their effect on quality and productivity.**
Goal 3	**Appropriate new technologies are transferred into normal practice across the organization.**

All three goals are typical of operationally excellent organizations, but in product innovative organizations it is not a goal to plan technology change, and technologies would not be evaluated with respect to their effect on quality and productivity unless that was the innovation area being targeted; rather they would be evaluated with respect to their impact on features and novelty. And for customer intimate organizations technologies would not be evaluated with respect to quality and productivity, but rather for wallet share and generalizability, flexibility; while planned change might be desirable I wonder if it would be a goal. Planning is not being optimized in product innovative and customer intimate firms (because predictability is not). The third goal seems to me to be appropriate for all market disciplines.

4 WHAT CAN WE OFFER PRODUCT INNOVATIVE AND CUSTOMER INTIMATE ORGANIZATIONS?

Product innovative organizations emphasize features, so improvement must be framed in that context. Accordingly, any processes that increase the number of features will be valued. Processes that emphasize competitive position, places in the product space where opportunity is the greatest, would be valued, so Quality Function Deployment would have high probability of being adopted into practice, for example.

Customer intimate organizations [2] emphasize flexibility because they have to constantly add features to the base product. Accordingly, any processes that increase generality and the ability to add features quickly would be valued. So processes such a product line architecture and application generators would be candidates for immediate adoption. So would peer reviews that emphasized limitations on choices, such a limits to the number of items that can be contained in a pull-down list or other "magic" numbers, limits, and constraints.

Additional examples. Let me relate several efforts in which I have participated:

1. One brokerage house was not interested in software costs or quality, but rather what it called time to market. In fact, it was not speed that was so important, but rather during the frantic time that a deal (such as an initial public offering) was being put together the Information Technology department was being asked to respond quickly. The response had to be quick enough so that the broker could earn as much as possible by offering as many services as possible. It was a question of wallet share, which in turn is a customer intimate approach. The brokerage wanted the customer to maximize its spending with the brokerage so it had to have the longest menu of services possible. We settled on improvements that would be a measure of the percentage of the total deal that did not go to the brokerage. I/T's job, then, was to offer a realistic plan for continual reduction of that (missed wallet share) figure.
2. One computer-oriented defense contractor said it wanted project measures, but when pressed it was clear that projects were not managed - and therefore not measured - in the traditional way. The government client wanted a provider that would do what it requested, not to study the request and offer alternatives or to object or argue. Cost, quality, and duration were not important to the client (despite protestations to the

contrary), only that it got what it wanted in reasonable terms. This, too, is a customer-intimate approach, one that makes the menu of services just as long as the customer requests are. Naturally, the provider has to deliver the systems within a threshold value of cost, quality, and duration, but there were already many other providers that performed better in terms of cost, quality, and duration, but were rated too low in customer responsiveness to be considered! In fact, the client changed its mind often, rendering previous work inapplicable. This would cause rework that would traditionally be held against the provider. Traditional project-oriented measurement was irrelevant in this setting. We recommended several improvements that were measured as follows: of the total spent by the customer how much went elsewhere (to be minimized); time spent in adversarial settings, an hostility index (to be minimized); time spent with the customer understanding its business (to be maximized); and number of people on our staff with credentials like our client's (to be maximized).

3. A computer services firm had been the prime contractor for a long time for a government client. The computer services firm provided all of the computer programming and operations for a particular type of payment that the government entity made to deserving applicants. The contract was up for renewal and the incumbent wanted to propose a set of improvements going forward that would indicate its operational excellence. The improvements would be framed or operationalized as measurements. The "usual suspects" were offered in discussions with the provider (now bidder), but those measures did not seem to resonate, even though they were "reasonable." It turns out that the government organization was feeling behind the times in terms of technology and really wanted a new, modern I/T provider, not a better, cheaper, faster provider of old technology. In fact, there was no (evident) business driver for the desire for more modern technology, only a (vague) belief that such technology would reap financial benefits to the government in terms of lower costs and greater flexibility. The measures we settled on were:

   - plan vs. actual implementation of a set of new technology introductions,
   - hours spent training the government client on the principles of that new technology,
   - reliability measures directly related to the government organization's business, for example, cost of government rework due to provider payment errors, idle government worker hours due to system downtime, and government time spent in meetings or on the phone with deserving applicants due to provider service failures.

   These measures were instead of other, traditional measures, such as percentage system availability (e.g., 99.9% available), data entry error rates (0.1%), and a threshold number of abnormal job terminations (ABENDs) per day, none of which related to the government mission or daily reality.

5 CORROBORATION: *THE INNOVATOR'S DILEMMA*

Clayton Christensen, in his seminal work, *The Innovator's Dilemma* [1], offers some interesting corroboration of the central theses advanced here: one size of improvement does not fit all sizes of strategy. Christensen's work is a detailed and thorough study of how and why industry leaders faltered and eventually lost commanding leads in their market niches.

He notes that products go through cycles that change the basis of competition, that change the markets that would be attracted to the products. Innovative products start out offering features, then evolve to greater reliability, then added user convenience, then low price. Stated another way, the first market is for some kind of performance, usually captured as features. As the features offered by each provider come to be about equal, the next basis of differentiation is reliability. Then when all providers offer about the same reliability, the next area of competitive differentiation is convenience of use. When all of the competitive products offer about the same convenience, then it becomes a commodity and is indistinguishable from its competitors, except by price.

Clearly, the style of improvement needed at each stage is different, emphasizes different aspects of products. Standard software improvement programs only improve reliability and thereby decrease cost. Therefore, at least two stages, performance and convenience, are not addressed using the traditional forms of software improvement.

6 SUMMARY

In summary, we need to align our improvement technology to our clients' market strategies, and when we do many of our implementation and transition concerns become manageable. This is a classic case of mutual adaptation[1], a model we often say we espouse, but it seems rarely apply.

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[1] Mutual adaptation is the implementation strategy that in order to introduce a new technology into an organization, the organization has to adapt to the technology and the technology has to adapt to the organization. That is, both have to be tailored to each other.

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